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## ABSTRACT

The curriculum guide outlines a course for grades 11 and 12 in carpentry designed to provide instructions in mathematics and its application to determining construction costs. Students completing the course will be expected to have the skills and knowledge of building construction plans, concrete forms, walls, roofs, doors and stairs, in addition to a basic knowledge of mathematics. Course goals, specific block objectives, and course outlines are provided for the following nine instructional blocks: an introduction to contracts, general overhead, power equipment costs, and cost of materials; construction agreements; overhead; manpower and machinery; walls and finishes; windows, doors, hardware, and finishes; roofs; electrical, plumbing, and air conditioning; and the Quinmester posttest. A bibliography and sample of the Quinmester posttest are appended. (Author/NH)

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AUTHORIZED COURSE OF INSTRUCTION FOR THE



Course Outline

CARPENTRY - 9163  
(Building Construction Estimating)

Department 48 - Quin 901897

003213

DADE COUNTY PUBLIC SCHOOLS

1450 NORTHEAST SECOND AVENUE

MIAMI, FLORIDA 33132

Course Outline

CARPENTRY - 9163  
(Building Construction Estimating)

Department 48 - Quin 901897

county office of  
VOCATIONAL AND ADULT EDUCATION

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**Dade County Public Schools**  
**Miami, Florida 33132**

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### Course Description

<u>9163</u>	<u>48</u>	<u>901897</u>	<u>(Building Construction Estimating)</u>
State Category	County Dept.	County Course	Course Title
Number	Number	Number	

**Overview:** A study of mathematics and its application in determining construction costs.

**Objectives:** Students will calculate the total cost of several building materials predetermined by the instructor.

**Content:** A study of mathematics, overhead and the cost of building materials and skilled labor.

**Selection Considerations:** Students in this course will be expected to have the skills and knowledge of building construction plans, concrete forms, walls, roofs, doors and stairs in addition to a basic knowledge of mathematics.

## PREFACE

This ninth quinmester course outline is designed to provide instructions in predetermining the total cost of buildings to be constructed.

It is divided into (9) blocks and may be taught in a double quinmester (2 hour block) for 90 clock hours or a (3 hour block) for 135 hours.

Students in this course will be expected to have the skills and knowledge of building construction plans, concrete forms, walls, roofs, doors and stairs, in addition to a basic knowledge of mathematics.

This advance course is presented in grades 11 and 12. Upon completion of this course, students will demonstrate understanding and knowledge (to construct a basic stair), on how to estimate building construction costs.

Instruction is accomplished by means of lectures and demonstrations. Emphasis is placed on manipulative processes.

The bibliography lists materials offering additional information in this field.

This outline was developed through the cooperative efforts of instructional and supervisory personnel and the Vocational Curriculum Materials Service, and has been approved by the Dade County Vocational Curriculum Committee.

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I. INTRODUCTION (7 Hours)	
Contract. . . . .	1
General Overhead. . . . .	1
Power Equipment Costs . . . . .	1
Cost of Materials . . . . .	1
II. CONSTRUCTION AGREEMENTS (10 Hours)	
Contractual. . . . .	1
Specifications. . . . .	2
Organizational Estimating . . . . .	2
III. OVERHEAD (17 Hours)	
Salaries. . . . .	3
Office. . . . .	3
Professional Services . . . . .	3
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## GOALS

The student must be able to:

1. Demonstrate the ability to develop attitudes, skills, knowledge and values required for entering the carpentry trade.
2. Realize the existence of career opportunities available in the construction field.
3. Show interest by participating in class activities of research and calculating costs in estimating building costs.
4. Determine the total cost of construction parts or members shown on a building construction plan designated by the instructor.

## **SPECIFIC BLOCK OBJECTIVES**

### **BLOCK I - INTRODUCTION**

The student must be able to:

1. Explain what a building construction contract is.
2. State some of the responsibilities of both the owner and contractor.
3. Explain the meaning of overhead.

### **BLOCK II - CONSTRUCTION AGREEMENTS**

The student must be able to:

1. List two kinds of building agreements.
2. Explain the meaning of insurance and bonds.
3. Define the meaning of cost estimating.

### **BLOCK III - OVERHEAD**

The student must be able to:

1. Define the meaning of overhead expenses.
2. List some costs encountered on the jobsite.
3. Total several overhead expenses listed by the instructor.

### **BLOCK IV - MANPOWER AND MACHINERY**

The student must be able to:

1. List the hourly wages of the four prime tradesmen.
2. Explain the cost difference between rental and owned machinery.
3. Define the meaning of contractor and subcontractor.

### **BLOCK V - WALLS AND FINISHES**

The student must be able to:

1. List and find costs for all materials needed to install and finish a frame wall.
2. Total the costs of necessary materials for finishing a block wall with wood panels.
3. Estimate the cost of a predetermined wood scaffold, including time and labor cost.

### **BLOCK VI - WINDOWNS, DOORS, HARDWARE AND FINISHES**

The student must be able to:

1. Find the prices of five various type doors.
2. Estimate the cost of doors, windows and hardware for a building described on a construction plan.

## BLOCK VII - ROOFS

The student must be able to:

1. Calculate the cost of the material for a cut roof described by a roof plan.
2. Define "cut frame roof" and "truss roof".
3. Find the cost of a truss roof, including labor as defined by the instructor.

## BLOCK VIII - ELECTRICAL, PLUMBING AND AIRCONDITIONING

The student must be able to:

1. Explain the difference between "roughing in" and "finish" electrical or plumbing work.
2. Define conduct, outlet, panelboard and breaker in the electrical trade.
3. Define fixtures, water closet and copper tubing fittings in the plumbing trade.

**Course Outline**  
**CARPENTRY - 9163**  
**(Building Construction Estimating)**  
**Department 48 - Quin 901897**

**I. INTRODUCTION**

- A. Contract**
  - 1. Owner's responsibilities
  - 2. Contractors' responsibilities
  - 3. Agreement provisions
  - 4. Specifications
- B. General Overhead**
  - 1. Salaries
  - 2. Office
    - a. Rent or own
    - b. Electric and telephone
  - 3. Professional services
  - 4. Insurances and bonds
  - 5. Wages of tradesmen
- C. Power Equipment Costs**
  - 1. Rental
  - 2. Ownership
    - a. Cost
    - b. Maintenance and repair
  - 3. Pile driver
  - 4. Crane contract
- D. Cost of Materials**
  - 1. Concrete
  - 2. Reinforcement steel
  - 3. Form wood
  - 4. Concrete blocks
  - 5. Lumber
  - 6. Doors and windows
  - 7. Wall finishes
  - 8. Roofing materials
  - 9. Bolts, screws, nails and others
  - 10. Piles

**II. CONSTRUCTION AGREEMENTS**

- A. Contractual**
  - 1. Types of agreements
    - a. Lump-sum
    - b. Unit price
    - c. Cost plus

2. Agreement provisions
    - a. Scope of work
    - b. Completion time
    - c. Contract adjustments
      - (1) Labor wages
      - (2) Material
    - d. Retaining percentage
    - e. Final payment
      - (1) Inspection
      - (2) Acceptance
  3. Bonds
    - a. Bid
    - b. Performance
    - c. Labor and material
    - d. Subcontract
      - (1) Performance
      - (2) Labor
      - (3) Payment
    - e. Insurance
- B. Specifications
1. Advertisement for bids
    - a. Public contracts
    - b. Public agencies
  2. Instruction to bidders
    - a. Proposals
    - b. Commencement and completion
    - c. Responsibility
  3. General conditions
    - a. Pumping and shoring
    - b. Temporary offices
    - c. Temporary utilities and enclosures
    - d. Material substitution
    - e. Soil conditions
    - f. Fabrication and installation drawings
  4. Alternates to owner
  5. Specification errors
- C. Organizational Estimating
1. Daily log and notebook
  2. Whether or not to bid
    - a. Examining drawings
    - b. Examining specifications
    - c. Site visit
    - d. Resource trades
    - e. Staff consultation
      - (1) Work-up sheets
      - (2) Summary sheets
    - f. Errors and omissions

### III. OVERHEAD

#### A. Salaries

1. Executives
2. Secretaries
3. Estimators
4. Purchasing agents
5. Bookkeeper(s)
6. Draftsmen
7. Office clerks

#### B. Office

1. Rent or cost of building
2. Electricity
3. Heat and air conditioning
4. Office supplies
  - a. Postage
  - b. Telephone
  - c. Advertising
  - d. Literature
5. Depreciation

#### C. Professional Services

1. Lawyers
2. Accountants
3. Architects
4. Engineers
5. Company vehicles
6. Insurance
  - a. Fire and theft
  - b. Public liability
  - c. Vehicles
  - d. Property damage
  - e. Workman's Compensation
  - f. Social Security
  - g. Unemployment

#### D. Jobsite Overhead

1. Salaries
  - a. Superintendent
  - b. Foreman
  - c. Watchman
  - d. Travel expenses
2. Temporary office
  - a. Utilities
  - b. Office supplies
  - c. Office equipment
3. Legal
  - a. Bonds
  - b. Liens
  - c. Permits and licenses
  - d. Insurance
4. Material
5. Labor

#### IV. MANPOWER AND MACHINERY

##### A. Labor Costs

1. Wages
  - a. Carpenter
  - b. Electrician
  - c. Plumber
  - d. Mason
  - e. Union others
2. Rules
  - a. Safety
  - b. Overtime
  - c. Holidays
  - d. Benefits

##### B. Power Equipment Costs

1. Ownership
2. Operational
3. Depreciation
4. Interest
5. Rentals
6. Costaccounting

##### C. Excavation Specifications

1. Soil
2. Unit of measure
3. Equipment
4. Perimeters and areas
  - a. Topsoil removal
  - b. General excavation
  - c. Specific excavation
  - d. Backfilling
  - e. Rough grading
5. Top soil and landscaping
6. Subcontractors fee
7. Overhead and profit
8. Piles
9. Pile driver contractor
10. Asphalt paving
11. Subcontractor
12. Labor

##### D. Concrete Work Costs

1. Concrete
2. Form wood
3. Steel ties
4. Reinforcement steel
5. Crane contractor
6. Subcontractors
7. Rentals
8. Labor

- E. Masonry Costs
  - 1. Material (brick, stone etc.)
  - 2. Dampproofing material
  - 3. Mortar holding screen
  - 4. Mortar
  - 5. Nails
  - 6. Subcontractor
  - 7. Waterproofing
    - a. Membrane
    - b. Plaster
    - c. Asphalt
    - d. Drains
  - 8. Labor

## V. WALLS AND FINISHES

### A. Concrete Wall Costs

- 1. Concrete
- 2. Forms
- 3. Steel ties
- 4. Reinforcement steel
- 5. Power equipment
- 6. Scaffolds
- 7. Rentals
- 8. Subcontractor
- 9. Crane contractor
- 10. Labor

### B. Block Wall Costs

- 1. Blocks
- 2. Mortar
- 3. Scaffolds
- 4. Power equipment
- 5. Rentals
- 6. Subcontractor
- 7. Labor

### C. Drywall and Wetwall Costs

- 1. Supporting materials
  - a. Studs
  - b. Joists
  - c. Furring
  - d. Metal studs
  - e. Metal tracks
  - f. Metal furring
  - g. Nails
- 2. Drywall
  - a. Gypsum wallboard
    - (1) Tape
    - (2) Paste
    - (3) Fasteners
  - b. Paneling
    - (1) Adhesives
    - (2) Fasteners



3. Labor

D. Wetwall Construction Costs

1. Rock lath
2. Diamond lath
3. Metal bath and corner beads
4. Plaster
  - a. Base coat
  - b. Finish coat
  - c. Stucco
  - d. Gypsum tile
5. Number of coats
6. Labor

VI. WINDOWS, DOORS, HARDWARE AND FINISHES

A. Window and Curtainwall Costs

1. Aluminum frames
  - a. Wood backing
  - b. Glass
  - c. Glazing
2. Screens
3. Hardware
4. Weatherstripping
5. Mullions
6. Sills
7. Stools
8. Flashing
9. Lintel
10. Caulking
11. Labor

B. Door Costs

1. Residential and commercial
  - a. Swinging
  - b. Double swinging
  - c. Accordion
  - d. Pocket sliding
  - e. Double pocket sliding
  - f. Revolving
2. Garage
  - a. Vertical sliding
  - b. Rolling
  - c. Overhead track
3. Frames
4. Glass
5. Hardware and accessories
6. Labor

C. Wood Flooring Costs

1. Kind of wood
2. Cushion material
3. Accent strips

4. Base trim
5. Nail
6. Filler
7. Primer
8. Varnish, schellac or laquer
9. Labor
- D. Resilient Covering Costs
  1. Kind of resilient
  2. Primer or damproofing
  3. Cushion
  4. Adhesive
  5. Labor
- E. Carpet Costs
  1. Kind of carpet
  2. Primer or damproofing
  3. Cushion
  4. Nails and strips
  5. Corners
  6. Labor

## VII. ROOFS

- A. Precast Concrete Costs
  1. Roof slabs and tees
  2. Beams
  3. Girders
  4. Masonry
  5. Insulation
  6. Weatherproofing material
  7. Subcontractor
  8. Erection contractor
  9. Labor
- B. Structural Steel
  1. Beams
  2. Girders
  3. Joists
  4. Decking
  5. Fasteners
  6. Seam sealers
  7. Insulation
  8. Weatherproofing material
  9. Subcontractor
  10. Erection contractor
  11. Labor
- C. Wood Frame
  1. Trusses or framing members
  2. Sheathing
  3. Asphalt felt
  4. Nails
  5. Flashing
  6. Trim

7. Cant strips
8. Erection contractors
9. Subcontractors
10. Labor

## VIII. ELECTRICAL, PLUMBING AND AIR CONDITIONING

### A. Basic Electrical Costs

1. Conduit
2. Wire
3. Outlets
4. Switches
5. Panelboards
6. Breakers
7. Outlets, weatherproof
8. Control panels

### B. Finish Electrical Costs

1. Fixtures (wall, ceiling etc.)
2. Fixture mounts
3. Electrical ceilings
4. Clocks
5. Buzzers and bells
6. Alarm systems
7. TV outlets
8. Subcontractor
9. Labor

### C. Plumbing Costs

1. Valves
2. Tank
3. Sleeves
4. Water closet
5. Bath tub
6. Lavatory
7. Shower and fixtures
8. Water heater
9. Sinks
10. Copper tubing
11. Various fittings

BIBLIOGRAPHY  
(Building Construction Estimating)

Basic References:

1. Badzinski, Stanley, Jr. Carpentry in Commercial Construction. Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1974. Pp. 292.
2. Badzinski, Stanley, Jr. Carpentry in Residential Construction. Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1972. Pp. 308.
3. Blueprint Reading and Sketching, Carpentry Trades. Albany: Delmar Publishers, Inc., 1958. Pp. 260.
4. Dagostino, Frank R. Estimating in Building Construction. Reston, Virginia: Prentice-Hall Company, 1973. Pp. 294.
5. Durbahn, Walter E. Fundamentals of Carpentry. Vol. I. Chicago: American Technical Society, 1963. Pp. 510.
6. Durbahn, Walter E. Fundamentals of Carpentry. Vol. II. Chicago: American Technical Society, 1963. Pp. 523.
7. Study Guide in Carpentry. Vols. I and II. Chicago: American Technical Society, 1967. Pp. 750.

Supplementary References:

8. The American Builder. Bristor: Simmon-Boardman Publishing Co., 1967. Pp. 576.
9. Building Trade Math. Examination Problems. Florida: Department of Education, Federal Correctional Institution, 1969. Pp. 1194.
10. Modern Carpentry. South Holland, Illinois: Goodheart-Wilcox Co., 1968. Pp. 743.
11. Tools, Material, Ethics and History of the Trade. Unit I. Indianapolis: United Brotherhood of Carpenters and Joiners, 1959. Pp. 979.

**APPENDIX**  
**QUINMESTER POSTTEST SAMPLES**

## QUINMESTER POSTTEST

NAME \_\_\_\_\_ DATE \_\_\_\_\_ SCORE \_\_\_\_\_

### Multiple Choice Test Items

Each statement needs a word, a figure or a phrase to make it correct. Only one of the choices listed is correct. Place the letter of the choice you make in the space provided at the left.

- \_\_\_\_\_ 1. A contract is an:
  - a. Arrest
  - b. Aggregate
  - c. Agreement
  - d. Assignment
- \_\_\_\_\_ 2. The cost of a truck would be listed as:
  - a. Overhead
  - b. Depreciation
  - c. Insurance
  - d. Material
- \_\_\_\_\_ 3. Form wood costs should be filed under:
  - a. Logs
  - b. Hardware
  - c. Concrete
  - d. Materials
- \_\_\_\_\_ 4. The rental cost of a vehicle would be considered:
  - a. Insurance
  - b. Hardware
  - c. Operating cost
  - d. Overhead
- \_\_\_\_\_ 5. A list of materials and measurements could be indicated as:
  - a. Plans
  - b. Specifications
  - c. Surveying
  - d. Expenses
- \_\_\_\_\_ 6. An offer to build at a fixed price is:
  - a. Rental
  - b. Buying
  - c. Bidding
  - d. Contracting

- \_\_\_\_\_ 7. Examining construction plans and specifications is necessary in:
- a. Fire prevention
  - b. Estimating
  - c. Safety
  - d. Accounting
- \_\_\_\_\_ 8. Lack of information in the specifications could cause a loss of:
- a. Time and profit
  - b. Tradesmen
  - c. Rentals
  - d. Travel
- \_\_\_\_\_ 9. Estimating nearly always includes:
- a. Food costs
  - b. Profit
  - c. Loss
  - d. Road costs
- \_\_\_\_\_ 10. In order to reduce concrete form costs they should be:
- a. Stored
  - b. Enlarged
  - c. Reused
  - d. Painted
- \_\_\_\_\_ 11. Cost of a job is determined by multiplying time by hourly rate and adding cost of:
- a. Rentals
  - b. Contract
  - c. Material
  - d. Tradesmen
- \_\_\_\_\_ 12. Estimating requires a basic knowledge of:
- a. Science
  - b. Mathematics
  - c. Geography
  - d. Trigonometry
- \_\_\_\_\_ 13. Precast concrete is often installed by the:
- a. Supplier
  - b. Plumbers
  - c. Casters
  - d. Buyer
- \_\_\_\_\_ 14. Both wetwall and drywall can be estimated by the:

- a. Cubic foot
- b. Cubic yard
- c. Square foot
- d. Length

\_\_\_\_15. The cost of concrete is determined by the number of:

- a. Cubic yards
- b. Cubic feet
- c. Square yards
- d. Square feet

\_\_\_\_16. To find the amount of concrete needed for a footing we multiply:

- a.  $L \times W \times H$
- b. Area  $\times$  length
- c.  $H \times$  feet
- d.  $C \times H \times L$

\_\_\_\_17. To find the number of blocks needed we can use the:

- a. Weight
- b. 8"  $\times$  16"
- c. Count
- d. Square method

\_\_\_\_18. Subcontractors usually work by the:

- a. Hour
- b. Contract
- c. Day
- d. Union

\_\_\_\_19. Excavation cost can be arrived by figuring time or:

- a. Cubic dirt
- b. Square feet
- c. Cubic measure
- d. Square yards

\_\_\_\_20. In order to price doors we need the:

- a. Brand
- b. Size
- c. Trade mark
- d. Color and thickness



## QUINMESTER POSTTEST ANSWER KEY

### Multiple Choice Test Items

1. c
2. a
3. d
4. d
5. b
6. c
7. b
8. a
9. b
10. c

11. c
12. b
13. 2
14. c
15. a
16. a
17. d
18. b
19. c
20. b